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CUBIC CONTENT AND REPRODUCTION COST

GENERALLY, the trained estimator can take off with reasonable accuracy the quantities of materials necessary for the construction of a structure; however, it takes an experienced contractor to know the best and most economical methods of construction and the least hours of labor needed to build the structure. The competent and experienced contractor is as important a determinant of construction cost as building material prices and wage rates.

Therefore, with all types of structures, including the single-family dwelling, the most accurate method of estimating building costs prior to construction will be that employed by the contractor in preparing his bid when he takes off full bills of materials, plans his construction process, estimates hours of labor, secures bids from subcontractors on specialized construction such as plumbing, heating, electrical work, etc., and estimates all overhead items of cost such as architect's fees, taxes and insurance during construction, etc.

It is a lengthy and costly process for the contractor to prepare his bid. Often it will cost the contractor several hundred dollars to bid on one of the larger dwelling properties, and in cases of large projects requiring extensive investigation, the cost of preparing a bid may run into the thousands. It becomes evident that the appraiser cannot afford to use the costly method of the contractor when finding the maximum value of the structure appraised, but must use a simplified and less costly method when finding construction cost of a proposed structure or reproduction cost of an existing structure.

The method of figuring the size or volume for all types of buildings has been used successfully for many years. In May 1928, the American Institute of Architects issued Document No. 239, in which "Standard Cubic Contents" was defined, and a definite method of its calculation was prescribed. This method from such an authoritative source has remained unchanged for the past 20 years. A reprint of this document appears on page 228.

From this definition of "Standard Cubic Contents," it will be noticed that every building is measured in exactly the same manner and includes the actual cubic space (expressed in cubic feet) enclosed within the outer surfaces of the outside or enclosing walls and contained between the outer surfaces of the roof and six inches below the finished surfaces of the lowest floors. It is specifically stated that the cube of dormers, penthouses, vaults, pits, enclosed porches and other enclosed appendages is to be included as a part of the cube of the building. In our opinion, the definition would include the cube of the chimney as a part of the cubic contents.

A. I. A. Document, No. 239

THE AMERICAN INSTITUTE OF ARCHITECTS
THE OCTAGON, WASHINGTON 6, D. C.

CUBIC CONTENTS OF BUILDINGS—A STANDARD METHOD OF CALCULATION AND FORM OF STATEMENT.

DEFINITION OF "STANDARD CUBIC CONTENTS":

The cubic content (cube or cubage) of a building is the actual cubic space enclosed within the outer surfaces of the outside or enclosing walls and contained between the outer surfaces of the roof and six inches below the finished surfaces of the lowest floors.

INTERPRETATION:

The above definition requires the cube of dormers, pent houses, vaults, pits, enclosed porches and other enclosed appendages to be included as a part of the cube of the building. It does not include the cube of courts or light shafts, open at the top, or the cube of outside steps, cornices, parapets, or open porches or loggias.

SUPPLEMENTARY INFORMATION:

The following items shall be listed separately:

(a) Cube of enclosed courts or light shafts open at top, measured from outside face of enclosing walls and from six inches below the finished floor or paving to top of enclosing walls.

(b) Cube of open porches measured from outside face of wall, outside face of columns, finished floor and finished roof.

It is recommended that the following items also be listed separately:

(a) Square foot area of all stoops, balconies and terraces.

(b) Memoranda, or brief description, of caissons, piling, special foundations, or features, if any.

EXPLANATION:

The above specification of "Standard Cubic Contents" is adopted as a method of conveying exact basic facts about a given building to all interested so that they may be subject to verification without misunderstanding. The basic facts should be the same to all. Each will use the figure in his own way. Valuations per cubic foot will vary with classification of the building, with quality as specified or executed, according to the judgment and purpose of the individual appraiser.

EXAMPLES:

Cubic contents of buildings shall be stated clearly in f suggested by the following examples:

Office Building of Mr. Blank at Blank Address:

Standard Cubic Contents	1,750,000 cu. ft.
Supplementary information	
Allowance for caisson foundations	150,000 cu. ft.

Residence of Mr. Blank at Blank Address:

Standard Cubic Contents	18,500 cu. ft.
Supplementary information	
Open porches	1,500 cu. ft.
Terraces	200 sq. ft.

NOTE:—This document supersedes the first edition, A. I. A. Document No. 215. The methods of cubing contained in the Competition Code, and elsewhere, will be harmonized in principle with the standard method above described. Comments, criticisms, and suggestions for improvement are invited. This Document is issued by authority of The Board of Directors, May 15, 1928.

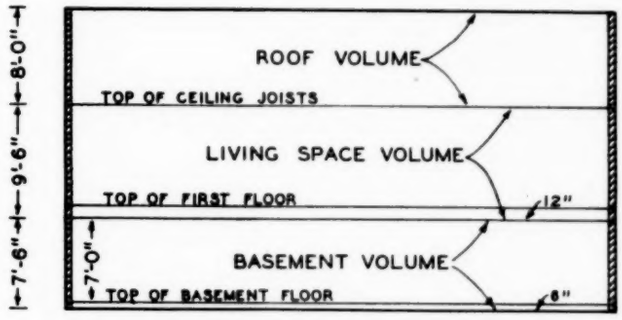
1-8-48—500

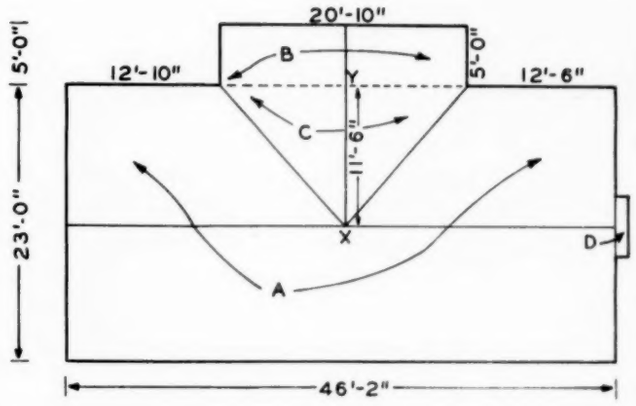
Those volumes which are not considered a part of the standard cubic contents are clearly stated in the interpretation. The appraiser must make certain that for each property he appraises, he follows the definition closely and includes only those volumes that are specified a part of cubic content.

The actual measurement of a structure and the estimate of the number of cubic feet in its standard cubic contents is not a difficult job. We have selected a comparatively simple house (our standard five-room brick veneer bungalow) to demonstrate the application of this method of arriving at the correct cubic content.

The diagram below shows the necessary measurements and formulae used in figuring the volume of this building.

A = 46'2 x 23'0" x 21' = 22,295 cubic feet
B = 20'10" x 5' x 21' = 2,187 cubic feet
C = $\frac{20'10" \times 8'0" \times 11'6"}{2 \quad 3}$ = 319 cubic feet
D = chim. = 5 sq. ft. x 21' = 109 cubic feet*
24,910 cubic feet†





*Includes 4 cubic feet for portion of chimney above ridge pole.

†This is a correction of the figure 23,913 cubic feet previously published in our Trends Bulletin.

The height of sections A, B and D is obtained by adding the 7'0" basement height; six inches for basement floor; 9'6" for the first floor living space; and 1/2 the height of the full length gabled roof (8' ÷ 2 = 4'): 7' + 6" + 9'6" + 4' = 21'. The formula for finding the volume of section C is the same used in finding the volume of a pyramid - area of the base (which is triangular, $\frac{20'10" \times 8'0"}{2}$) x 1/3 the height. In this case, the "height" is the length of the ridge pole from point x to point y, or 11'6".

It may be of assistance and interest to consider the cubic content and cubic cost of the three main sections of this bungalow - basement space, living space, and attic space. In making these calculations, the following results were obtained:

	Cubic ft.	Cost	Unit Cost
Basement space, from 6" below top of basement floor to bottom of first floor joists	8,782	$ 2,079	23.7¢
Living space volume, bottom of first floor joists to top of first floor ceiling joists, including heating, plumbing, electrical systems, etc.	11,125	8,676	78.0¢
Roof volume, top of ceiling joists to roof surface	5,003	1,396	27.9¢
	24,910	$12,151	48.8¢

The great variance in the cubic cost of these three sections is particularly significant when it is realized that different proportions of these three sections would give quite a different cubic cost. From figures of this type it will be possible for an appraiser to arrive at an estimate of cubic cost for a bungalow without a basement, or with partial basement, or of different roof height. It is evident that the appraiser cannot use a uniform cubic cost for all properties of a particular type of same construction quality.

It has been our experience that the cubic cost method is a particularly valuable guide to an appraiser in arriving at an estimate of the value of residential or other non-income-producing buildings. Where there is no income, it is impossible or impractical to use the income approach in arriving at value, so without a sound knowledge of construction costs and a thorough method of applying this knowledge, the appraiser must rely entirely on the comparison (comparative) method when appraising this type of property.

An experienced appraiser, using properly kept cost data, should be able to estimate reproduction cost within 10 per cent. He must, however, establish and build up his own cubic cost data from information gathered on actual construction jobs. He must maintain contact with several contractors and building material dealers in order to stay abreast of rapidly changing conditions within the building industry. These regular checks on changes in the construction market are an important part of an appraiser's routine work.

Appraisal of any type of real estate is a highly technical profession, and the better cost data an appraiser keeps and the more uniform and thorough his method of applying these data, the more intelligent will be the results obtained. As mentioned before, without accurate cost data, intelligently and uniformly applied, the appraiser of non-income-producing property must fall back on the none-too-satisfactory comparative method.

THE foregoing bulletin was started under the supervision of Alfred B. Kissack, for the past 20 years head of our appraisal and special study department. It was completed after his death.

Alfred Broughton Kissack was one of the founders of this company in 1928. Over its entire existence he has headed the appraisal and special study department, supervising the appraisals on large properties in many of the principal cities of the United States. During the past six years he has edited the Appraisal Bulletins.

Trained as an engineer, Mr. Kissack characteristically saw each problem in terms of its component parts. A clear, concise thinker, he preferred to write out his bulletins in longhand, carefully studying the implications of each word.

During the last few years he was particularly interested in passing on to other members of the organization the skills and specialized knowledge which he had acquired, and which poor health warned him he could not long continue to use himself.

His genial good humor, his innate kindness and sympathetic understanding made him a counselor to those associated with him on many matters apart from real estate.

We who have lost a close personal friend, as well as a business associate, will attempt to carry on that part of the work which he did so well.

Officers and Staff
ROY WENZLICK & CO.